NIT-133-05

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Prior Application:	K. YASUDA et al Serial No. 09/666,883 Filed: September 20, 2000
Group Art Unit:	1655
Examiner:	B. Forman
For:	POLYNUCLEOTIDE SEPARATION METHOD AND APPARATUS THEREFOR

PRELIMINARY AMENDMENT

Commissioner of Patents
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

Page 1, before the first line of the specification, please insert the sentence:

--This is a continuation application of U.S. Serial No. 09/666,883, filed September 20, 2000, which is a continuation application of U.S. Serial No. 09/522,465, filed on March 9, 2000 (now U.S. Patent No. 6,218,126), which is a continuation application of U.S. Serial No. 09/329,318, filed June 10, 1999 (now U.S. Patent No. 6,093,370). This application is related to U.S. Serial No. 09/790,872, filed on February 23, 2001.

Pages 16 and 17, the paragraph bridging these pages from page 16, line 22 to page 17, line 19, replace the paragraph with:

Convergent light 51 is then irradiated through the objective lens 15 to the target polynucleotide hybridization area 142 where the target polynucleotide 42' is hybridized to the probe 42; the photoabsorbing layer 21 in the area 142 absorbs the convergent light 51 and evolves heat. The heat from the photoabsorbing light 51 and evolves heat. The heat from the photoabsorbing layer 21 in the area 142 allows the vicinity of the area 142 to increase its temperature up to about 95°C, and hence hydrogen bonds between the probe 42 and the target polynucleotide 42' are dissociated to denature the target polynucleotide 42' along which has been hybridized to the area 142. When the size of an area where the convergent light is converged is smaller than that of a unit target polynucleotide hybridization area, the light axis should be adjusted to ensure that the convergent area is within the target polynucleotide hybridization area. When a unit target polynucleotide hybridization area has a smaller size than the convergent area of the convergent light, individual areas should preferably be arranged in such a manner that gaps between individual target polynucleotide hybridization area are sufficient and only one area is to be heated by the convergent light. In FIG. 3, only one probe is shown in each target polynucleotide hybridization area to be easy to read, but in practice, a plurality of probes having an identical base sequence are generally immobilized to each area.

Pages 18 and 19, the paragraph bridging these pages from page 18, line 14 to page 19, line 2, replace the paragraph with:

FIG. 4 illustrates a second means for heating a specific area on the substrate 1. The photoabsorbable thin layer 21 is formed on the target polynucleotide hybridization areas in the embodiment of FIG. 3, whereas, in the present embodiment, particles 23 each having photoabsorbing characteristics and have sufficiently small sizes in comparison with those of the target polynucleotide hybridization areas are dispersed and placed on the target polynucleotide hybridization areas. At least one particle should be placed on each area. According to the present embodiment, heat insulating layers 22 is separately provided in each of individual areas and the particles 23 are placed onto the upper surface of the insulating layer 22. The substrate 1 comprises substrate base 13 composed of electrically conductive film 131 and thermally conductive insulating substrate 132 as well as in the embodiment illustrated in FIG. 3.--

IN THE CLAIMS

Cancel claim 1, and add new claims 30-37 as follows:

--30. A cell components recovering apparatus comprising: a substrate being disposed in a separation cell, wherein the sample solution containing cells is supplied on a surface of

the substrate, and a plurality of independent areas are formed on the surface of the substrate;

capturing means for capturing each of the cells one by one separately on each of the areas; and

temperature control means for heating the surface of the substrate at one area of the areas to a predetermined temperature to destroy the cell captured at the one area of the areas, to liberate cell components from the cell captured at the one area of the areas into the separation cell, wherein, by introducing a washing solution into the separation cell, whereby the cells at the areas, except for the one area of the areas, remain on the areas, respectively, the washing solution is recovered to recover the cell components liberated from the cell; and

wherein, by changing a position of the one area of the areas, the washing solution is recovered to recover the cell components liberated from the cell for each of the areas.

--31. A cell component recovering apparatus according to claim 30, wherein the cell is a white blood cell.

--32. A cell component recovering apparatus according to claim 30, wherein the capturing means comprises means for

applying an alternating field onto the surface of the substrate.

--33. A cell components recovering apparatus according to claim 30, further comprising means for applying a DC field onto a surface of the one of the one area of the areas in a solution which contains no polynucleotide and has a pH value of 4 or lower, to attract nucleotide components to the surface of the one of the identified positions.

--34. A cell components recovering apparatus comprising:

a substrate being disposed in a separation cell, wherein the sample solution containing cells is supplied on a surface of the substrate, and a plurality of independent areas are formed on the surface of the substrate;

capturing means for capturing each of the cells one by one separately on each of the areas;

means for identifying the positions of the areas where the cells to be destroyed are present; and

temperature control means for heating the surface of the substrate at one of the identified positions to a predetermined temperature to destroy the cell captured at the area of the one of the identified positions, to liberate cell

components from the cell captured at the area of the one of the identified positions into the separation cell,

wherein, by introducing a washing solution into the separation cell, whereby the cells at the areas, except for the area at the one of the identified positions, remain on the areas, respectively, the washing solution is recovered to recover the cell components liberated from the cell; and

wherein, by changing a position of the identified positions, the washing solution is recovered to recover the cell components liberated from the cell for each of the identified positions.

--35. A cell component recovering apparatus according to claim 34, wherein the cell is a white blood cell.

--36. A cell component recovering apparatus according to claim 34, wherein the capturing means comprises means for applying an alternating field onto the surface of the substrate.

--37. A cell component recovering apparatus according to claim 34, further comprising means for applying a DC field onto a surface of the one of the identified positions in a solution which contains no polynucleotide and has a pH value

of 4 or lower, to attract nucleotide components to the surface of the one of the identified positions.--

REMARKS

Examination is requested.

Respectfully submitted,

John R. Mattingly
Registration No. 30,293
Attorney for Applicants

MATTINGLY, STANGER & MALUR
1800 Diagonal Road, Suite 370
Alexandria, Virginia 22314
(703) 684-1120
Date: December 6, 2001

MARKED UP VERSION OF REPLACED PARAGRAPH(S) OF THE SPECIFICATION

Pages 16 and 17, the paragraph bridging these pages from page 16, line 22 to page 17, line 19, replace the paragraph with:

[Divergent] Convergent light 51 is then irradiated through the objective lens 15 to the target polynucleotide hybridization area 142 where the target polynucleotide 42' is hybridized to the probe 42; the photoabsorbing layer 21 in the area 142 absorbs the convergent light 51 and evolves heat. The heat from the photoabsorbing layer 21 in the area 142 allows the vicinity of the area 142 to increase its temperature up to about 95°C, and hence hydrogen bonds between the probe 42 and the target polynucleotide 42' are dissociated to denature the target polynucleotide 42' along which has been hybridized to the area 142. When the size of an area where the convergent light is converged is smaller than that of a unit target polynucleotide hybridization area, the light axis should be adjusted to ensure that the convergent area is within the target polynucleotide hybridization area. When a unit target polynucleotide hybridization area has a smaller size than the [divergent] convergent area of the [divergent] convergent light, individual areas should preferably be arranged in such a manner that gaps between individual target polynucleotide hybridization area are sufficient and only one

area is to be heated by the convergent light. In FIG. 3, only one probe is shown in each target polynucleotide hybridization area to be easy to read, but in practice, a plurality of probes having an identical base sequence are generally immobilized to each area.

Pages 18 and 19, the paragraph bridging these pages from page 18, line 14 to page 19, line 2, replace the paragraph with:

FIG. 4 illustrates a second means for heating a specific area on the substrate 1. The [photoabsorvable] photoabsorbable thin layer 21 is formed on the target polynucleotide hybridization areas in the embodiment of FIG. 3, whereas, in the present embodiment, particles 23 each having photoabsorbing characteristics and have sufficiently small sizes in comparison with those of the target polynucleotide hybridization areas are dispersed and placed on the target polynucleotide hybridization areas. At least one particle should be placed on each area. According to the present embodiment, heat insulating layers 22 is separately provided in each of individual areas and the particles 23 are placed onto the upper surface of the insulating layer 22. The substrate 1 comprises substrate base 13 composed of electrically conductive film 131 and thermally conductive insulating substrate 132 as well as in the embodiment illustrated in FIG. 3.--